DOCUMENT RESUME

ED 168 722 PS 010 492

AUTHOR Phyfe-Perkins, Elizabeth
TITLE Children's Behavior in Pre-School Settings: A Review of Research Concerning the Influence of the Physical Environment.
PUB DATE Apr 79
NOTE 56p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, California, April 8-12. 1979)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Behavior; *Classroom Materials; Early Childhood Education; Ecological Factors; Educational Principles; Educational Research; *Environmental Influences; Play; *Preschool Children; *School Space; Space Utilization
IDENTIFIERS *Proxemics

ABSTRACT

This review provides an overview of research relating the physical environment of the early childhood educational setting to children's behavior. Findings on space in relation to fixed and semi-fixed features (partitions, playground equipment, furnishings); spatial density; the arrangement of equipment and the division of space; the amount, variety, type and display of materials; holding power, children's attention span and social value of materials; the variety and complexity of materials in relation to an overall index of space quality; ecological studies of materials and other classroom variables; and the effect of activity settings are pointed out. Implications for practice are indicated. Main findings on the effects of materials provided to children in early childhood settings are summarized. The following principles have been extracted from the review: (1) space must be analyzed in terms of whether it provides for a full range of children's behavior; (2) systematic observation of children at play in the educational setting is crucial to an analysis of the environment; (3) there can be no one set of prescriptions for the optimal arrangement of space in early childhood settings; (4) in addition to space and materials, teacher behavior and program format constitute major variables in the early educational setting; (5) in preschool design, interrelationships among activity settings should be considered; and (6) planning to enhance child-environment involves a study of the ecology of the preschool. (Author/RH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED168722

CHILDREN'S BEHAVIOR IN PRE-SCHOOL SETTINGS:

A Review of Research Concerning the Influence of the Physical Environment

Elizabeth Phyfe-Perkins
Laboratory of Psychometric and Evaluative Research
University of Massachusetts, Amherst

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Elizabeth Phyfe-Perkins

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

PS010492

Paper presented at the Annual Meeting of the American Educational Research Association
April 1979
San Francisco

TABLE OF CONTENTS

Page

Introduction. 1

Fixed and Semi-fixed Feature Space. 4

Crowding.....4
The Arrangement of Equipment and the Division of Space.....10

The Amount, Variety, Type and Display of Materials. 20

Holding Power, ATtention Span and Social Value of Materials.....21
The Variety and Complexity of Materials Related to an Overall Index of Space Quality.....26
The Amount, Type and Display of Materials.....28

Ecological Studies of Materials and Other Classroom Variables 32

The Effect of Activity Settings.....40

Conclusion. 44

References. 47

CHILDREN'S BEHAVIOR IN PRE-SCHOOL SETTINGS:
A Review of Research Concerning the Influence
of the Physical Environment

Introduction

Whether one takes the position that early interaction with a stimulating environment is crucial for development (Hunt, 1961; Bloom, 1964; Deutsch, 1966) or the more pragmatic approach that environmental design helps manage behavior (Kritchevsky & Prescott, 1969; Dodge, 1978), early childhood educators tend to be interested in the physical aspects of classroom organization. The purpose of this paper is to summarize the literature that focuses on the relationship between the physical environment and children's behavior in educational settings.

J. McV. Hunt (1961, 1969) stressed the role of early interaction with the environment in determining the rate and nature of development, both mental and physical. He stressed the need for a rich and varied environment that allows for sufficient experience in antecedent activities. Hunt formulated the "problem of the match" for early childhood ducators. He called for teachers, to arrange the learning environment so that the children would meet with experiences that are sufficiently incongruous with their previous learning. The correct match is neither too discontinuous nor too familiar, thereby, stimulating an "optimal" interaction with the world.

However, Kagan et al. (1978), after a two year study of children raised in a day care center and in their own homes, comes to the conclusion that there is little evidence to support the prediction of

future characteristics from behavior measured during the first two years. If one supports the idea of development as an interactive process then it is sensible to expect instability of traits over time as the child interacts with more,and more varied,settings. "We are led to suggest, therefore, that if a psychological structure established in early childhood is to be maintained for a long period of time, and some are, it must be supported by the current environment" (Kagan et al., 1978, p. 144).

If we provide for an optimum level of child environment interaction in the preschool years, but cannot control future environments what prognosis can we make concerning children's future development. This is a crucial question for early childhood educators as well as for the significance of the studies reviewed in this paper. Kurt Lewin (1931) offers a rationale for our attention to the immediate environment of young children. He asserts that, although situational effects cease when the child goes out of the field or setting, the influence of that environment remains because there have been changes in the individual as s/he interacted with the setting. Thus the environment ". . .changes his 'basis of reaction' to all later situations" (Lewin, 1931, p. 123).

Foreshadowing the work of the ecological psychologists such as Barker and the environmental psychologists such as Proshansky, Ittleson, and Rivlin, Lewin speaks of the valences or coercive nature of the environment.

> Objects are not neutral to the child but have an immediate psychological effect on its behavior: many things attract the child to eating, to climbing,to grasping,to manipulating,to sucking, to raging at them, etc. These imperative

> environmental facts—we shall call them valences determine the direction of behavior. Particularly from the standpoint of dynamics the valences, their kind (sign), strength, and distribution, must be regarded as the most important properties of the environment. (Lewin, 1931, 101)

The valence of an object is positively correlated with the needs of the child at the moment. It derives its strength and positive or negative sign from the fact that the object either satisfies the child, is a means to such satisfaction, blocks the child or is rivaled by other forces in the field. Valences change with the age and developmental level of the child as well as with the psychological state of the child. Behavior is seen as a function of the interaction between the person and the environment: $B = P\ E$ (Lewin, 1931). Thus, the concern of this paper with environment in Early Childhood Education is based on an interactionist theory of development and a pragmatic interest in the influence on behavior of the display, type, and amount of materials as well as characteristics of the physical space.

Exploration of the effect of the physical environment on behavior involves the conceptualization of various dimensions of physical space. Fixed and semi-fixed feature space are two categories utilized by Hall (1969) in his study of physical effects called Proxemics. Fixed features include doors, windows, room size, and other permanent aspects together with our human expectations regarding their permanence. Semi-fixed features include furniture, rugs and large pieces of equipment. This category was expanded by Weinstein (1975) to include color, warmth and texture. Hall adopts the terminology of Osmond (1955) when he describes two opposing configurations of semi-fixed feature space. Sociopetal space brings people together as in the

the arrangement of tables and chairs in a French sidewalk cafe. Sociofugal space keeps people apart as in the placement of long benches in a railway station waiting room. Hall's thesis is that people are affected by the dimensions of fixed and semi-fixed features and that one's perceptions of, and attitudes toward, spatial elements are culturally bound.

The second heading under which various studies are reviewed is that of moveable objects. The amount, variety , type and display of materials in early childhood settings will be examined in reference to children's behavior. Thirdly, the influence of activity settings which may include objects, expectations for behavior, physical space and adult behavior, will be explored. Research pertaining to the effects of these three categories will be considered in the search for significant principles underlying the influence of the physical environment on child behavior in preschool settings.

Fixed and Semi-fixed Feature Space

Crowding

There have been various studies of the effect of crowding on the social interaction of young children (Hutt & Vaizey, 1966; Preiser, 1972; Loo, 1972; McGrew, 1972; Smith & Connolly, 1972, 1976; Smith, 1974). With the exception of Loo, Preiser, and McGrew the studies reveal that the level of social interaction, including aggressive acts, increases as space decreases. McGrew (1972) distinguished between two aspects of crowding: social density, increasing the number of a persons in a space, and spatial density, decreasing the amount of space available to a constant number of people. Running behavior

was decreased when the space was reduced regardless of the size of the group in the space. But when space was held constant and the number of children was increased, the incidence of running was not influenced. McGrew found that children moderated their social interaction when social density was increased, perhaps to avoid conflict situations. McGrew concluded that both the variables of space and number of children were significant in relationship to preschool children's behavior. With a reduced density of children (space remaining constant), more solitary activity and fewer aggressive acts occurred. Where space was reduced and the number of children was retained, there was less running and more physical contact among children.

Preiser reduced the floor space of a preschool from 35 sq. feet per child to 22 square feet keeping the amount of equipment and toys constant. The author did not find increases in social interaction or aggression. He did draw the following conclusions regarding the reduction of space:

> The differentiation of activity areas is blurred.
> Children tend to stand rather than sit or kneel.
> Some children decrease their levels of social interaction.
> Single person usage of objects tends to decrease.

Loo (1972) found significantly less aggression, less social interaction, and more interruption of activities in the high spatial density condition for groups of six four and five year olds. Loo kept moveable object resources constant in both conditions. He compared 44 square feet per child to 15 square feet per child. Loo analyzed his findings in the following manner:

> The effect of spatial density on aggression may differ from that of social density. In a condition where space remains constant while people

> increase, the new members may be perceived as the cause for discomfort. On the other hand, when the number of people remain constant while space decreases, members do not see each other as causes of their discomfort; rather they may perceive they are all pawns to something greater than themselves, their physical environment. In such a condition, it is postulated that aggression between members would be significantly less. . . . Assuming that interaction with other children is conducive to maturity of social behavior, crowdedness over a long time span may retard the development of more mature social behavior in children. (Loo, 1972, pp. 379-380.)

Peck and Goldman (1978) in a naturalistic study of children's play behavior with a simple versus complex play structure found that increased social density resulted in significant increases in imaginative play, the sharing of a common play theme and neutral or onlooker behavior. The authors speculate that the addition of more peers in the play structure area stimulated the positive aspects of play by providing more opportunity for sharing of themes and interaction among dramatic sequences. The increase in the onlooker category may be related both to a decrease in social interaction due to crowding (Preiser, 1972; Loo, 1972) and/or due to interest in watching the increasingly imaginative sociodramatic play going on in the space. The number of square feet per child in the crowded and uncrowded conditions are not reported.

Smith and Connolly (1976) in presenting some of their recent research propose a formula for identifying the parameters that have been manipulated in studies of crowding.

N = number of children in the group

R_S = spatial resources

R_P = play equipment resources

D_s = spatial density = $\frac{N}{R_s}$

D_p = play equipment density = $\frac{N}{R_p}$

They suggest that the major crowding studies have manipulated different aspects of the environment and, thus, have achieved conflicting results. Other problems with these studies include the lack of distinction between aggression and rough and tumble play, the confounding influence of novelty in some of the restricted space conditions, and the violation of the independence requirement of statistical analysis which serves to overestimate the size of the significance levels found.

Smith and Connolly carried out three successive studies in naturalistic settings. Group size was varied in each of three conditions in which equipment and space were expanded to keep the same ratio ($D_p + D_s$) constant. In other words, the number of children increased as the equipment (R_p) and spatial (R_s) resources increased. No significant main effects were found except for a decrease in rough and tumble play in the smallest group size/resources condition for only one of the experimental groups. In the second experiment both spatial (R_s) and play equipment (R_p) resources were varied independently with group size being held constant at 24 children. One, two or three basic sets of play equipment were provided to the children at different times during each spatial density condition: 25, 50, or 75 square feet per child. As there were no significant interaction effects only the results for spatial variation will be presented here. There were no significant effects for group play (Parten's [1932] associative and coopeartive play categories) or

aggression, but rough and tumble play decreased significantly (.05 level) in the highest spatial density condition (25 square feet per child).

The third experiment varied spatial density using 15 square feet per child or 60 square feet maintaining a group size of 10 in one group, 30 in another and an equipment density (D_p) of one play set per ten children. There was a nonsignificant tendency for less group play in the higher spatial density condition and significantly more aggression (.01 level) for one group in the small space condition. Rough and tumble play decreased significantly as space decreased. The authors suggest a possible threshold effect of 25 square feet per child for aggressive behavior. Smith and Connolly conclude that increasing spatial density to 15 square feet per child results in more aggression. However, Price (1971) and Loo (1972) used spatial densities of 15 square feet per child and found a decrease in social interaction. Their negative findings on increased aggression may be due to the inclusion of rough and tumble play (which decreased at 14 square feet per child) in the category of aggression (Smith & Connolly, 1975). Shapiro (1975) found a threshold effect in that uninvolved behavior in a nursery school remained constant (15%) between 30 and 50 square feet per child but increased to 26% below 30 and to 20% above 50 square feet per child.

Pollowy (1974) found that as the floor area expanded (no dimensions presented) there was an increase in child-equipment interactions as well as an increase in the use of the floor for the unexpected use of equipment. Simultaneously, the appropriate use of

tables and table top equipment decreased. As a plausible explanation of these results the author suggests that the increase in floor area increased the children's initiative in choosing activities.

Krantz and Risley (1972) varied the spatial density of a constant number of children in familiar nursery activity settings. When the children were crowded onto a 3 x 4 foot blanket listening to a teacher reading a story their level of attentiveness and lack of disruptive behavior fell to 60% from a mean of 87% when they were spaced in a semicircle two feet apart. During a teacher-led demonstration of materials they were coded as attentive only 51% of the time in the crowded condition as opposed to 90% when they were seated around a table.

In a study of the effect of spatial density on Head Start teacher's controlling behaviors, Perry (1977) found that teachers in classrooms with less than 30 square feet per child exhibited more controlling behavior toward children (46.7%) than teachers who had over 49 square feet per child at their disposal (16.2%). In eight of the ten higher spatial density classrooms free play consisted of playing with manipulative materials at tables as opposed to the use of blocks, wheel toys and doll corner in the larger classrooms. Although the author does not record specific differences in resources within the two groups of classrooms, one can infer from the description of free play that the smaller classrooms contained fewer and smaller items than the larger ones. Shapiro (1975) observed children's behavior in 17 pre-school classrooms which varied in size from 29 to 52 square feet per child. She found that in the crowded classrooms (under 30 square feet per child) non-involvement of children was the

highest, occurring 26% of the time. This behavior category included deviant, onlooker and random behaviors. In classrooms measuring between 30 and 50 square feet per child non-involvement fell to 15% and in large classrooms, over 50 square feet per child, non-involvement rose to 20%. The first finding, that of high non-involvement in crowded classrooms echoes the threshold effect suggested by Smith and Connolly (1976) that below 25 square feet of space per child aggressive behavior increases. Since Shapiro included deviant behavior in the category of non-involved, but did not report component scores, it may be that the incidence of deviancy contributed largely to the increase of non-involvement in classrooms having less than 30 square feet per child.

It seems that broad generalizations are not warranted about space variation, per se, except for a possible bottom threshold of 25 to 15 square feet per child for increased aggression, lower social interaction, and increased non-involvement. When social density increases and/or when the competition for equipment resources increase then there seems to be more apparent effects.

The Arrangement of Equipment and the Division of Space

Prescott and Jones (1967) carried out a large study of 50 randomly selected day care facilities in Southern California. Among their findings was that average sized play grounds, 2,000-4,000 square feet, were seven times more likely to be of "high yard quality" than small yards (less than 2,000 square feet) and four times more than large yards (above 4,000 square feet). They also found that the shape of the yard was consistently related to its level of organization: the

relationship between clear paths, yard boundaries, and amount of surface covered with equipment (Prescott & Jones, 1967, p. 274). Square yards had consistently low levels of organization in that a large open "dead" space often occurred in the middle. Irregular shaped and rectangular yards, using the same principle of placing objects around the perimeter, fared better because the middle area resembled a long path, channeling children along to other activities. The author's definition of "high quality" space leads into an analysis of Hall's (1966) second category, that of semi-fixed features. All yards were rated according to the level organization (defined above), special problems, and three items concerning their equipment: degree of complexity, variety, and amount. Maximum crowding of yards was related to low yard quality.

> Space quality clearly predicts differences in teacher behavior and children's responses. High quality space is associated with sensitive and friendly teachers, interested and involved children, non-routine encouragement, and high numbers of lessons in consideration and creativity. Low space quality tends to have neutral and insensitive teachers, children who are less involved and less interested, increased guidance and restriction and lessons in rules of social living tend to be high. . . .
>
> We feel that our data have shown not only that space strongly influences behavior in day care centers, but also that space itself is subject to influence by other factors, and that by and large the staff has little or no awareness of either influence. (Prescott & Jones, 1967, pp. 330-331)

The organization of equipment within a fixed space has been the subject of various authors (Fitt, 1974; Sheehan & Day, 1975; Day & Sheehan, 1974; Irwin & Bushnell, 1976; Mangurian, 1975; Kritchevsky & Prescott, 1969; Dodge, 1978). The size of play spaces within a

room tends to regulate the size of the group and thus may draw children of varying social abilities and inclinations. Fitt (1974) found that a classroom arranged in several large areas contained groupings of from five to eight children often involved in noisy boisterous activities. Whereas a separate classroom arranged in small learning areas was typified by groups of two and three children, engaged in quieter interactions. There was more large muscle movement in the former and more task involvement in the latter.

As Proshansky and Wolfe (1974) have noted there are two major ways that the physical design affects the learning process in classrooms: (1) the physical arrangement communicates a symbolic message of what is expected to happen, (2) there are functional consequences resulting from the arrangement of the furniture (e.g., several seats around a small table encourage conversation as opposed to rows of individual desks).

Although the design of semi-fixed features is often a concern of early childhood practitioners, there is little organized material relating the arrangement of equipment to children's behavior. Day and Sheehan (1974) related the integration of the physical space, materials arrangement and adult-child interactions in nurseries and day care settings to seven growth producing categories of child and teacher behaviors. Positive elements of organization included the use of several small rooms, provision for privacy, accessibility of materials, frequent adult-child interactions, and the compatibility of adjacent learning areas. However, no specific research was reported that related such environmental variables to frequencies of child behavior. Dodge (1978) suggests that the design of semi-fixed

feature space and the display of materials will elicit various behaviors and feelings in children, but again there is no research reported.

Sheehan and Day (1975) recommend the presence of both open and enclosed spatial areas to provide for the needs of children in day care. Open space does not allow children to escape noise and stimulation, whereas small spaces allow for privacy, introspection and retreat. These authors noticed particular children wandering or in irritable and aggressive moods in centers that contained no private areas. In such a large open space classroom known for its noisy boisterous character, the authors added six foot dividers and low shelves for frequently used materials. They reported a subsequent drop in frantic behavior, more cooperation and less noise. Irwin and Bushnell (1976) suggest that interest areas be spread out on a noisy-quiet, active-passive continuum. They suggest that rooms can be arranged so that the amount of waiting and readying behavior is diminished. Mangurian (1975) describes a "structured open plan" which makes use of strong visual cues that continue to organize the space when the moveable partitions are withdrawn. Without the partitions a free flowing open environment is available to all the children. Moveable walls contain shelves and display areas. Structural steel beams support swings or divider curtains easily. He suggests that the children and teachers can control such an environment rather than be controlled by it.

The clarity and size of paths among activity centers has been emphasized by Kritchevsky and Prescott (1969) and Pollowy (1974). Pollowy found that an increase in the ease with which children could visually identify learning areas was accompanied by a concommitant increase in the number of child-equipment interactions. There is no further definition of what constituted the "easy identification of learning areas" but perhaps the guidelines of Kritchevsky provide an operationalization of the concept of clarity. Paths may be too narrow, thus inviting an inappropriate flow of activity, may be visually obstructed at the child's eye level, may awkwardly detour around a sandbox (thus encouraging children to take a "short cut"), may lead children to a "dead" space or simply may be non-existent. The authors describe the behavioral consequences of each. They advocate the formation of clear paths as an environmental means of channelling children's energy into appropriate activity and preventing disruptions of ongoing activity.

In terms of conclusive research on the arrangement of semi-fixed feature space, work has been done with adults in mental health institutions (Osmond, 1955; Sommer, 1959, 1969; Ittleson, Proshansky & Rivlin, 1970). Following Osmond's (1955) work on the arrangement of furniture to encourage social interaction, Sommer (1959) found that people occupying seats at corner table spaces talked more than people seated along side or across from each other. Srivastava and Good (1968) found that interaction occurs more often in spaces that have a functional reason for people congregating there (e.g., a nursing station or a window that provides contact with the outside world).

Eastman and Harper (1971) acknowledge the support or lack of it that the physical environment can offer for certain activities. They advocate that designers not only plan to support all the anticipated activities of potential users thus maximizing behavioral freedom but also plan the environment to channel behavior, thus encouraging some behaviors while limiting others. For preschool children, these objectives for behavioral planning, are most appropriate because this age child needs a protective environment yet one that allows freedom to exercise new skills and interests.

An example of behavioral planning is evident in a comparison of two third grade integrated day classrooms (Zifferblatt, 1972). The dependent variables of task attention span and number of correct problems were higher in one class and the incidence of non-task talking and non-task movement was lower. The organization of semi-fixed features supported the desired behaviors in the successful classroom. Desks were arranged in clusters of three or less in separate areas (vs. one cluster of 12 desks), thus restricting visual and verbal distractions and providing for small group interaction over tasks. There was a private cozy nook that children used for quiet study or personal retreat. There were comfortable areas set aside for chatting and socializing thus channeling this behavior in an appropriate way and avoiding the "contamination" of work areas. The function of each of the environmental provisions is, of course, speculative (Zifferblatt, 1971) as no controlled research was carried out. However, this study suggests the importance of providing spaces for a full range of behavior.

Provision for privacy has been advocated by various educational authors (Day & Sheehan, 1974; Proshansky & Wolfe, 1974; Prescott, 1978). R. Sommers (1969) has explored man's need to regulate his interaction with the world in his book Personal Space, the Behavioral Basis of Design. Zifferblatt (as noted above) cites the provision of a small cubby-like private space as one of several variables that promoted task involvement and higher educational achievement in one classroom. Prescott (1978) in a comparison of home day-care and two types of center based day care, notes that the child may easily find private space in the home but not in the classroom. The provision of private spaces was associated with the presence of softeness. Indicators of softness included:

> child/adult cozy furniture: rockers, couches, large pillows, etc.
> large rug or full carpeting
> grass on which children can play
> sand for children to play in
> dirt for digging
> animals to hold and fondle
> single sling swings
> play dough
> water play opportunities
> very messy materials such as mud, finger paint clay, shaving cream
> laps, adults holding children
>
> (Prescott, 1978, p. 16)

Homes had high softness ratings. Closed structure day-care centers (in which teachers make most of the decisions) contained three or fewer of the above indicators. These centers also ranked lowest in provision for privacy. Although the observed child behaviors cannot be linked solely to the presence or absence of privacy and softness, it is of interest to note that closed structure settings registered much lower frequencies of children being physically active, giving

orders, selecting and choosing, asking for help, giving opinions and playful intrusions, that either open structure settings (medium) or home care. Home care settings had the highest frequencies of the "thrusting behaviors" just listed as well as the highest softness and privacy ratings. It seems self-evident that young children may need a chance to rest and to control or limit their interaction with the world when they feel the need, not just at nap time. However, no research that isolates the provision for privacy or lack of it has been located that demonstrates the behavioral consequences for preschoolers. Campbell (1972) reports that preschoolers did not choose to use private spaces for solitary activity. He reported that their attention span on such activities was longer if they could look up and see other children playing.

However, several authors, Kohl (1970), Mack (1976), and Gramza (1970) have explored children's preference for privacy. Gramza manipulated the degree of encapsulation or "closedness" of play boxes from two sides up to 5 or 6. Children preferred complete enclosure in varying sizes of boxes. In examining the attributes of closed space with one side open that might attract children, 32" cubes were constructed of opaque, transluscent, and clear plexiglass. Children consistently preferred the opaque and transluscent boxes lending support to the idea that the attraction of enclosed space includes a visual limitation as well as a physical boundary. Herbert Kohl (1970) in a discussion with elementary school students about how to improve the classroom environment found that they wanted private work spaces where they could think, work, or have a private conversation.

Mack (1976) gave 9, 10 and 11 year old children permission to create private space in the classroom. They used cardboard and paper to close off areas utilizing: a large metal T.V. stand, a corner of the room, a closet, a storage cabinet, the area underneath tables, the tops of tables and a large packing box. Children reported relief, increased ease of concentration and the ability to complete assignments.

These informal reports are in accord with Canter and Kenny (1975) who suggest that privacy is the right to regulate the input and output of information to and from oneself. He sees this attempt to regulate as the basis of all human behavior in relationship to spatial features.

Other variables in the physical environment that have been associated with successful child care include the provision of sufficient workspace (Proshansky & Wolfe, 1974; Weinstein, 1977; Prescott & Kritchevsky, 1972), an appropriate noise level (Proshansky & Wolfe, 1974; Cohen and Lezak, 1977; Weinstein & Weinstein, 1978), and the juxtaposition of learning areas to allow appropriate crossfertilization (Proshansky & Wolfe, 1974; Day & Sheehan, 1974). Cohen and Lezak explored the effect of noise on the perception of social cues in adults in a laboratory setting and found that high noise levels inhibited social but not task-related cues. Weinstein and Weinstein assessed the effect of naturally occurring background noise on the reading achievement scores of fourth graders in their own home rooms. The authors found no averse effects of noise on achievement except that children tended to work more slowly in the noisy condition.

In an impressive attempt to measure preschool environments, Harms and Clifford (1978) have prepared the Day Care Environment Rating Scale." This scale was developed from work done on the Day Care Environment Inventory (Harms & Cross, 1977). There are seven major variables which include: personal care of children, furnishings and display for children, language/reasoning experiences, fine and gross motor activities, creative activities, social development, and adult needs. Although only one category deals with physical space and formal research has not been carried out that relates the ratings for furnishings and display to children's behavior, the scale is one of the few attempts to measure environments for young children (cf. Prescott & Jones, 1967).

Although much more research is needed to relate aspects of fixed and semi-fixed feature space to behavioral outcomes in preschool settings the following design principles are tentatively offered:

-Crowding of children below 25 square feet per child for an extended period of time should be avoided. It may increase aggressive behavior and inhibit social interaction and involvement.

-If one must increase the number of children or decrease the amount of space adequate equipment must be provided for the number of children present to promote positive social behavior.

-Square yards are more difficult to organize well than are rectangular or irregular shaped yards. However, all yards can be arranged well.

-The level of organization of a play space can be measured by judging the clarity of paths (to children), the avoidance of dead space, the ratio of uncovered space to equipment-filled space and the presence of clear boundaries around activity areas.

-Clear paths may result in less disruptions and more goal related behavior.

-Arranging physical space in early childhood settings so that it provides for a range of children's behavior includes the following principles.

-Privacy seems to be a normal need of children in full-day group situations and the provision for privacy may increase desired behaviors.

-The provision for softness as in home care may allow children to snuggle and comfort themselves when adult laps are in short supply.

-Low noise levels may allow attention to social as well as task related cues in the environment.

-Small enclosed areas encourage quiet activity and small group interaction.

-Physically bounded small work spaces may reduce visual distraction and increase work-related behavior in classrooms.

-Large spaces allow for active boisterous play, large group activities and higher noise levels.

-The arrangement of seating spaces can encourage conversation or inhibit it.

-Juxtaposition of activity settings along a continuum from noisy to quiet and from active to subdued, may help children avoid distracting each other.

-Semi-fixed feature space may be arranged so that the functional consequences of the physical design support the behavioral goals set for the children.

The Amount, Variety, Type and Display of Materials

Various studies have been carried out relating materials to young children's behavior. Some studies looked at children's preferences

for toys (Bridges, 1927; Thomas, 1929; Bott, 1928; Hulson, 1930; Farwell, 1925; Herring & Koch, 1930; Majer & Grimer, 1955; Cockrell, 1935) and the type of social interaction that occurs when certain toys are used (Updegraff & Herbst, 1933; Van Alstyne, 1932; Hulson, 1930; Kawin, 1934; Murphy, 1937; Markey, 1935; Green, 1933; Qullitch & Risley, 1973). The effect of the amount of play materials on children's behavior has been investigated by Johnson (1935), Smith and Connolly (1973), and Doke and Risley (1972). Access to play materials has been studied by Montes and Risley (1975) and Pollowy (1974). Shure (1963) found that children's behavior differed depending on the learning center in which they were located. On the practical side, Kritchevsky and Prescott (1969) analyze materials according to the level of complexity and the "amount to do per child." These authors and Proshansky and Wolfe (1974) call for easy access to materials by children (also, Dodge, 1978) and a chance to follow through on activities without disruptions or distractions.

Holding Power, Attention Span and Social Value of Materials

Bridges (1927) observed 3-year-old children during free play with Montessori apparatus and found that graded cylinders, bricks, and color pairs were chosen most often with bricks being used for the longest amount of time followed by the cylinders. In her 1929 study of 4-year-olds, Bridges found that dressing games, cylinders, inset tracing and wooden insets were most popular. She concluded that materials that were colorful, presented self-evident problems and yet allowed for variation were chosen frequently and sustained the interest of the 4-year-olds. However, Bott (1928), observing 14, 2-, 3-, and 4-year-old children in nursery school found that raw

materials (e.g., clay, sand, blocks) and locomotor toys had the greatest appeal to all the children. Pattern toys gain in appeal as a child grows older while mechanical toys have little value at any age. Herring and Koch (1930) observed children alone in their homes with five toys and found that toys do vary in their power to attract children (average number of times toys used) and hold their attention (average amount of time per child spent with a toy). The truck was most attractive followed by the top, the acorns, tinker toy, box, and then the book. But the acorns had the highest holding power followed by the tinkertoy, truck and the book. Older children had longer attention spans. Children in a preschool setting maintained an average attention span of 5.3 to 6.5 minutes (Bridges, 1929) as opposed to 1.5 to 2.5 minutes in the Herring and Koch restricted setting. Farwell (1925) after observing 271 children during 30 minutes of free choice for fourteen days concluded that floor blocks, clay, watercolors, alabastine paint and sewing are the most popular with kindergarten, first and second graders. Drawing and paper construction are not very interesting, although there is more interest in them at each successive grade level.

Moyer and Gilmer (1955) attempted to maximize the attention span of children by providing them with specially designed toys in a non-distracting environment. Only one toy was provided to one child at a time. The authors conclude that toys must satisfy the developmental needs of the child at a particular age. One toy, the "people wagon," had a mean attention span of 15.6 minutes for three-year-olds which increased steadily to a mean of 31.9 minutes for six-year-olds. However, two other toys, the "circus wagon" and the "chips and wagon"

held the attention of two-year-olds the longest, with average spans of 26.5 minutes and 34 minutes respectively. The authors claim that "our data show there is no regular increase in attention spans of children from year to year for toys specifically designed for maximum holding power" (Moyer & Gilmer, 1955, p. 200).

Several studies in the thirties looked at children's behavior when they were playing with specific types of toys. Updegraff and Herbst (1933) compared the social interaction among two and three year olds when they were provided with blocks and with clay in a laboratory situation. The combined sociability index was higher for clay as was the frequency of cooperative behaviors. There were more instances of conversations unrelated to the material (clay) and more watching and imitating. More conflict occurred with blocks for the three year olds but also more mutual activity related to the material. Markey (1935) found cooperative behavior high when children played with blocks.

Hulson (1930) observed children in a preschool over a one-year period and ranked eighteen kinds of play materials according to the number of times chosen, the number of minutes used, the duration of usage (the holding power of the item) and its social value (defined as the number of children playing together). Blocks and sand ranked first and second respectively on all counts. Watching others was the third most popular activity with its social value being low. McDowell (1937) studying two- and three-year-old children during their free choice period, found that materials used in constructing other objects were used the most frequently by the children.

Van Alstyne (1932) observed 112 children in seven nursery and kindergarten classes as they played with twenty-five kinds of play materials. She assessed the popularity of the toys, their holding power, their social value, and their constructive vs. manipulative usage. The social value index included the amount of conversation that occurred, the amount of parallel, passive, and active cooperative play that occurred and the number of children engaged in play with a particular material. Raw materials, those that are openended and can be used in many ways, occupied children from 33 to 55 percent of the time. And within this category, blocks were used from one-third to one-half of the time raw materials were coded, with clay, painting and doll corner following in popularity. Raw materials elicited the longest attention spans. Throughout all age groups (three to five years) there was little interest in pattern toys (e.g., usage of the toy is determined by physical construction of the toy). There were definite social value differences among the materials. Dishes, hollow blocks, doll corner, big wagon, parallel bars, telephone, wooden blocks, colored cubes, ball, crayons, and clay all elicited conversation among children from 30 to 48 percent of the time. Passive cooperation was associated with clay, crayons, scizzors, painting, beads, puzzles, books and balls. Active cooperation occurred most often on the parallel bars (for 2 and 3 year olds only) and with the wagon, dishes, hollow blocks, wooden blocks, doll corner, colored cubes, and dump trucks. Van Alstyne found a positive relationship between age and the length of attention span, amount of conversation and amount of passive and active cooperation. Over 50 percent of

children of all ages tend to play by themselves when engaged with material. Ninety percent of the play of 2 year olds and 70 percent of the play of 5 year olds involves no active cooperation. There is a dramatic correlation between age and the constructive (versus manipulative) use of materials. Between 3½ and 4½ years, there is a rapid rise in the constructive use of seven raw materials: blocks, clay, scizzors, hollow blocks, crayons and colored cubes. Van Alstyne found that children were engaged with materials for 98% of the time they were observed, lending credibility to the importance of the materials in early childhood programs. The author suggests that the following factors may influence play behavior: amount of adult stimulation, prominent placement of materials, the ratio of toys to number of children, the amount of previous experience and the length of the play period (60 minutes as opposed to 45 minute periods elicited a 2-minute increase in the average attention span). Since there was such a wide range in children's preferences for a material (from 0% to 60%), and since attention spans varied from one to forty-five minutes, the author concludes that a wide variety of materials be made available to satisfy a range of individual needs. Since younger children played with twice as many toys as five year olds, she concludes that 2 and 3 year olds may need a greater variety of toys than older children.

In similar, but less extensive observational studies, Murphy (1937) reported that cooperative behavior was more frequent when children used swings, tricycles with a place for a rider, and wagons; and Green (1933) found that dramatic play materials in the doll corner

elicited the most cooperative behavior among preschoolers. Most of these studies reinforce the idea that children interact with different materials in qualitatively and quantitatively different ways. They are attracted to some materials more frequently and they seem to stay with other activities for longer periods of time. The social interaction among children appears to vary with the material.

The Variety and Complexity of Materials Related to an Overall Index of Space Quality

Different play materials have different potentials for play. Prescott and Jones (1967) and Kritchevsky and Prescott (1969) in two related publications have suggested an analysis of play equipment based on the level of complexity, the variety and the amount to do per child. Simple materials have one obvious use and do not have subparts (for example, swings and tricycles). Complex play units have subparts or involve the juxtaposition of two different types of material which allows the child to improvise and/or manipulate (e.g., play house with furniture, water table with equipment). Super complex units involve three or more types of materials (e.g., adding water and measuring equipment to the sandbox, having boxes and boards for use with the jungle gym). The more complex the unit, the more choices there are for the child to make in the course of his play and the more potential there is for group play. Complexity is seen as sustaining attention, and fostering dramatic play and social interaction. Variety is the measure of the number of different kinds of things there are to do. Variety is seen as facilitating free choice in programs where children are expected to play on their own for some length of time each day. The amount to do per child is a calculation of the number of play

spaces per child. This figure needs to be larger than one per child if the children are expected to choose their own activities at their own speed. Other play spaces must be available to a child when s/he has finished an activity. Otherwise adult direction is necessary to move children to and frcm the few available play spaces. Kritchevsky and Prescott suggest scheduling smaller groups of children or adding complex and super units as a means of increasing the number of available play spaces per child. The authors suggest that the variables of complexity, variety and amount to do per child as applied to an analysis of materials in early childhood settings are related to children's behaviors such as attention span, group participation, dramatic play, non-disruptive free choice of activities and goal directed behavior.

A figure representing yard quality (Prescott & Jones, 1967) was computed by combining the following scores: level of organization (described earlier) degree of complexity of equipment, variety of equipment, special problems and amount to do per child. This composite score for quality of physical space was then related to children's behaviors and other variables. High quality scores were positively related to high ratings of interest and involvement on the part of children. In addition, there was a direct relationship between the percent of yards that were crowded, the lowness of their quality of space ratings, and a lack of interest and involvement on the part of children. This finding is confirmed by Shapiro (1975) who found that crowded space (below 30 square feet per child) was disorganized. There were no clear boundaries between activity areas and children were "uninvolved" more than one-quarter of the time.

The Amount, Type and Display of Materials:

In an experimental manipulation of materials Quillitch and Risley (1973) provided seven-year-old children alternatively with six social toys and six isolate toys in a free choice situation. With the group size held constant there were dramatic differences in the amount of time children played together (social play) or played alone (isolate play) in the two conditions. It was found that social play occurred 16% of the time when the children were provided with isolate toys and 78% of the time when they were given the social toys. The social toys include: Don't Cook Your Goose, Don't Break the Ice, Don't Spill the Beans, Pick Up Stix, Checkers, Playing Cards. The six isolate toys are: Gyroscope, Crayons, Tinker Toys, Jig Saw Puzzle, Farmer Says, Talking Book, Play Doh. Thus, Quillitch and Risley have provided an example of the influence of the type of material provided on the social behavior of children.

Another area that has been investigated is the effect of the amount of materials on the behavior of children. Johnson (1935) observed three groups of children on three different playgrounds before and after a modification in the amount of toys and equipment. In the more extensively equipped condition (e.g., three foot wide slide, rocking boat, six tricycles, six wagons, six kiddy cars, twelve trucks, outdoor building blocks, two large boxes, saw horses, planks, kegs, spades and balls) children played more with materials, had more bodily exercise, fewer social contacts, and less undesirable behavior (e.g., tease, cry, quarrel, hit). A reduction in equipment resulted in less exercise, more social contacts and more teasing, crying and quarrelling. Doke and Risley (1972) found that children maintained

a high level of participation (e.g., using any of the materials in an appropriate manner or exhibiting any of 17 designated behaviors) when they were required to follow a rigid schedule of activities, only if there was an abundance of materials in each required activity.

Smith and Connolly (1973, 1976; Smith, 1974) varied both the type and amount of toys available to preschool children as well as the amount of space. Variation in the type of play resources produced some interesting findings. When children were provided with only apparatus (e.g., tables, chairs, Wendy house, baby carriages, climbing frame), they significantly increased their verbal and physical interaction. There was more cooperative and less parallel play. Smith (1974) was intrigued by the increased unusual use of equipment such as positioning the tables end to end as a platform for walking baby carriages and the lining up of chairs to form a pretend train. In a comparison of the two experimental conditions, the apparatus only situation resulted in more looking at other children, smiling, laughing, walking, pushing, pulling, sliding, climbing, and pedalling. In the toys only condition, there was more watching adults, being in a large group with an adult, and more object manipulation. The "toys only" condition involved the presence of beads, dolls, teddy bear, dress up clothes, tea set, drum, cymbals, bells, doll house easel and paints, sand pit and toys, bookcase, books, blocks, telephone, twenty chairs and three tables.

In a comparison of the control situation of both toys and apparatus with the "toys only" condition, children in "toys only" engaged in more object manipulation, less active physical play, less eye-rubbing,

nose picking, hand fumbling, etc. The authors speculate that perhaps the "toys only" condition represents a decrease in stress and indecision for the children and thus results in a decrease in stereotypic and automanipulative behaviors. It is interesting to note that the control situation revealed less aggressive behavior and thumb sucking than either experimental condition.

When the authors decreased the total amount of equipment (both toys and apparatus) in an earlier study, the frequency of stress behaviors such as thumb sucking increased. In a more recent study (Smith & Connolly, 1976) a decrease in equipment led to increased aggression similar to Johnson's (1935) findings. There were no significant differences in the level of cooperative play but rough and tumble play increased significantly in one group under the condition of fewer toys and apparatus. It seems that reducing the amount of toys per child does lead to increased aggression and that varying the type of equipment may affect the social interaction among the children. The number of children (increased social density) does not increase aggression as long as the amount of equipment increases commensurately. Since the majority of conflicts in preschools occur in relationship to materials (Smith & Green, 1975) it seems logical that a reduction should lead to increased aggression during free play situations when the most frequent activity is the use of toys and equipment.

The way in which materials are displayed has been considered an important factor in the behavior of preschool children (Kritchevsky & Prescott, 1969; Dodge, 1978; Brophy, Good, & Nedler, 1975; Montes & Risley, 1975). For example, Dodge asserts that messy and crowded

displays of materials do not encourage constructive use or care of materials. She advocates simplicity, labeling of shelves, sparseness of display and the organization of materials to teach concepts such as number, sequence, classification or color. However, there is little research available to substantiate such intuitively reasonable guidelines for arranging materials. Pollowy (1974) found that equipment distribution or layout that restricts child access or activity increases the supervisory involvement of adults.

In a study by Montes and Risley (1975) the environment of a day care center was rearranged so that children had three weeks of "free" access. The authors found that children engaged in more cooperative behavior, dramatic play and complex language interactions during the limited access periods.

Amount, type and display of materials do appear to have behavioral outcomes in preschool settings. A reduction of equipment may induce more aggression. It seems clear that attention to the type of toys provided can influence cooperative game playing and social interaction. In the next section, the influence of materials organized in activity centers will be reviewed. Many of these ecological studies investigate the difference in children's behavior associated with the type of material rather than amount.

Ecological Studies of Materials and Other Classroom Variables

A related group of studies has looked at the behavior of children within different programs (Tizzard, 1976; Rubin & Bryant: in Rubin & Seibel, 1979; Berk, 1976) and at behavior within subsettings of the classroom (Shure, 1963; Rosenthal, 1973; Shapiro, 1975; Weinstein, 1977; Rubin, 1976; Rubin & Seibel, 1979). Laura Berk (1976) carried out an observational study of five early childhood programs. She compared teacher's expectations to obtained percentages of the following categories: child involvement in type of activity, child behavior categories, group size that child plays in, teacher leadership pattern and degree of child-initiated activities. She found a wide range of discrepancies between actual classroom practices and teacher expectations. In addition, she related aspects of the educational environment to the variables of passive and active child behavior, teacher leadership pattern and child-initiated activities.

The Montessori program was the only one in which child-initiated activities predominated over teacher-initiated ones. Children were often manipulating (28%), readying (16.6%), exploring/wandering (15%), and working/listening (12.7%). The franchise day care predominated in passive child behaviors of: watching/listening (33.2%), non-active and waiting behaviors (6.8%), followed by readying (15.5%), and wandering/exploring (11.5%). Active leadership was the main teacher leadership pattern (34.9%) as opposed to the Montessori mode of not in activity (53.3%). In all centers, transitions took up a large percentage of children's time ranging from as much as 35% in the Montessori program to 20% in the community day care.

Tizzard et al. (1976) looked for differences among three types of program: traditional nursery, language emphasis nurseries, and preschools staffed with untrained personnel. They coded three aspects of play behavior: level of use of material, complexity of play organization and level of social participation. The information regarding children's behavior by play material was not reported. Most findings relate to relationships among the educational orientation of the center, and the sex, I.Q., language score and age of the child. The primary findings revealed that children in the language emphasis programs had better verbal comprehension scores. The provision of creative activities such as collage, finger painting and other art activities was negatively correlated with the amount of symbolic play observed among the children. In the traditional nurseries where a great deal of these activities were provided there occurred the least amount of symbolic play and the greatest amount of "appropriate" play. Tizzard et al. identified the following characteristics of the nursery group experience which they feel contribute to the relatively short average attention span obtained (less than five minutes) and the simplistic levels of play observed: a great range of alternatives, lack of pressure to persist by staff, and the distraction of numerous children.

Kenneth Rubin (1977) describes several studies of children's free play behavior in which he utilized a combination of the levels of social participation devised by Parten (1933) and the levels of cognitive play elaborated by Smilansky (1968). Not only does Rubin contribute observational categories that are highly relevant to the investigation of child-environment interactions but he also reports

some interesting relationships among free play behavior, materials used, age and measures of cognitive development. Rubin looked for the incidence of five levels of play (functional, constructive, dramatic, socio-dramatic, games with rules) when the child was engaged in solitary, parallel, associative or cooperative play. He found differences in levels of play and social participation according to the presence of the child in various activities. He also found that only certain aspects of social participation levels are related to the age of the child. Of special interest are his findings that older preschool children playing alone engage in high levels of constructive and dramatic play. Thus, with age, solitary play becomes more mature, a finding overlooked by research that uses only the Parten Scale. Rubin found significant positive correlations between the incidence of dramatic play and measures of spatial relations and classification skills. Correspondingly, low levels of dramatic play correlated negatively with these indices of cognitive development. However, it is Rubin's findings that levels of social and cognitive play are related to materials in the preschool environment that is of major interest. Children using playdough engaged in solitary or parallel play 65% of the time using a functional mode 75% of the time. Sand and water play were coded as 80% solitary or parallel play and 90% functional play. Whereas painting and crayoning scored 82% solitary or parallel and 78% constructive play. Use of puzzles had a similar social play profile but constructive play increased to 84%. Social interaction was scored 55% of the time for children engaged in house play and 75% of their play was dramatic or socio-dramatic. Cars and vehicles stimulated dramatic play 32%

of the time and social participation 50% of the time. One finding that emphasizes the teacher's role in influencing the social and cognitive value of preschool activities is the fact that reading and number activities involved associative or cooperative activity 63% of the time in the program studied.

Rubin and Seibel (1979) studied changes in children's activity preferences over a three month period. Time spent on puzzles and playdough decreased significantly while play with construction toys and with sand and water increased. These results are confounded by a physical design change that occurred. A wall was removed allowing full morning usage of the workbench, sandbox and waterplay table. These activities had been restricted to one-half that amount of time in the earlier observations. Changes in play categories over time included the emergence of constructive play over both functional and dramatic play in the block area during the second observation period. When the children engaged in dramatic play with blocks it was primarily cooperative whereas constructive block play was characterized by solitary and parallel play. The authors conclude:

> It would appear as if the degree of "freedom" [in free play] is somewhat determined by the materials available to children. For example, group and dramatic play may be inhibited by the availability of art activities. Such activities appear to encourage non-social and constructive behaviors. . . .The present study's findings appear significant for those who plan educational programs for young children. For example, it was discovered that group-dramatic play was inhibited by the presence of sand and water, puzzles and art activities. This form of play has recently been suggested, by some, to contribute significantly to the development of social competence and perspective taking skills. (Rubin & Seibel, 1979, pp. 7 & 8)

Rubin and Bryant (Rubin, 1979) compared the play behavior of children attending a Montessori preschool and those attending a traditional nursery. They found that the Montessori students engaged in significantly more solitary and parallel constructive play and significantly less cooperative functional and dramatic play than the traditional preschool children. In a study of carefully matched pairs of students, Dryer and Rigler (1969) attempted to explore the proposition that young children acquire the cognitive constructs which the materials in a Montessori school are intended to provide. The authors found the traditional nursery children to be significantly more creative on a non-verbal creativity test. These children approached the test situation in a markedly more social manner; they used significantly more functional terms to describe objects; and they included people in their drawings significantly more frequently. Montessori students were more task oriented in the test setting; they used significantly more physical attributes to describe objects and their drawing included many more geometric shapes. The authors feel that the study lends support to the ". . .notion that differing preschool educational environments yield different outcomes" (Dryer & Rigler, 1969).

Karlson and Stodolsky (1973) delved more deeply into how children utilize the Montessori curriculum. In a series of five minute observations children were found to exhibit significantly different patterns of involvement with activities. Children's activity preferences were analyzed in an attempt to predict their gain scores on subtests of the Wechsler Preschool and Primary Scale of Intelligence. Involvement in the following activities accounted for 76%

of the variance in the gains made by the children: art, 13.5%; construction toys, 16.8%; block, 7.0%; sorting and matching, 16.6%; and, math, 22.6%. Children's cognitive gains were significantly associated with the materials they used.

Shure (1963) observed children during free playtime in five sub-settings in a nursery school. She recorded the population density, the mobility of children in and out of areas, the appropriateness of behavior to the location, complexity of social participation, positive neutral or negative affect, amount of constructive play with materials and sex differences. She found that blocks and art had the highest social densities but this finding is confounded by the relatively large size of the areas. Shure found that the most constructive use of materials occurred in the art and book areas with blocks eliciting the lowest rating. Games and blocks had the highest ratings for solitary child play while complex social interaction was found most frequently in the doll corner and at least half the time in the block area. Shure suggests that the high levels of functional manipulation and onlooker behavior in the block area was due to the high social density and levels of social interaction. She also speculates that the high level of social interaction in the doll corner may be a function of the small size of the area. Finally, Shure foreshadows future studies with the question "Would a rearrangement or addition of equipment change some of the frequencies of the behavior found in this study?" (Shure, 1963, p. 990).

Carol Weinstein (1975, 1977) went about answering Shure's question: she recorded children's behavior within different areas

of an open classroom, then modified aspects of the physical design and recorded the behavior again. She avoided Shure's problem of confounding space and numbers of children by comparing the expected social density, determined by the size of the subsetting, with the obtained usage by children to arrive at a more accurate rating of the popularity of learning areas. Her intervention consisted of providing workspaces, chairs, more display of materials, more accessible storage of materials, addition of low partitions and provision of a quiet private place for rest. Specific hypotheses concerning changes in children's behavior were formulated and tested for significance. Weinstein successfully modified the children's patterns of space usage, resulting in children occupying areas they had previously avoided. Secondly, she increased the range of behavior exhibited in certain subsettings, as desired. And finally, she altered the frequency of specific behavior categories as predicted. This study presents a strong case for the influence of the physical environment on the behavior of children in educational settings.

Four more studies have assumed an ecological approach to the investigation of young children's behavior in school settings. Shapiro (1975) observing the free play behavior of 274 four-year-old preschool children noted a striking disparity between children's and teacher's preference for activity areas. She speculated that the difference perhaps results in a loss of spontaneous teaching/learning interactions. Children populated the block and doll corner areas 37% of the time but only 17% of teacher-child interactions occurred in those areas. However, the art areas where children spent 21% of the time averaged

35% of all teacher child contacts. The author suggests that teachers might set up more independent art activities so that they would be available for interaction and observation in the active block and housekeeping areas.

Rosenthal (1973) observed the involvement of children in various activity settings during 37 free play periods. The most popular settings include art, blocks and special activities, while puzzles, books kitchen, and sand were the least popular. Art and role play activities had the greatest holding power over children. Children averaged 20 activity shifts per hour with only three minutes of unoccupied time.

> Descriptive and statistical analyses consistently implicated setting variables as more significant predictors of the content and course of free play life than the demographic variables of sex, race and age. (p. 4004 A)

All of the ecological studies tend to point in one direction, that the early childhood subsettings, especially the provision of materials, have a strong influence on the children entering the area. Children in housekeeping corners are frequently talking to each other and engaging in dramatic play. A well-equipped block corner seems to offer children fascinating opportunities for building and for cooperative dramatic play. In the art room children are often more subdued less social and busy on their creations. It seems that if centers can select materials that match the children's interest and developmental needs, the activity centers can channel behavior in appropriate and educational pursuits.

The Effect of Activity Settings

Evidence for the effect of the behavior setting on children's behavior is offered by Emmerich (1977), Barker (1968), Doke and Risley (1975), Gump et al. (1957), Gump and Sutton-Smith (1955), and Gump (1964) as well as by many of the studies mentioned earlier. Doke and Risley compared day care students' involvement in planned activities during 15 minutes of "formal" activities in which all children were required to participate and 15 minutes of "informal" free choice periods. The authors found that children were consistently more involved in "informal" activities. However, the difference in subject matter between the "formal" and "informal" conditions confounds the findings. The authors suggest that aspects of "formal" activities that discourage task involvement include waiting while the teacher talks to one child or while s/he distributes the same materials to all the students. Whereas informal activities allow the children to choose among available materials and to proceed at their own pace. Emmerich (1977) compared teacher directed small group time (similar to the foregoing "formal" activities) and free play (similar to the "informal" condition). He found initial differences and changes over time in children's personal-social behavior that were associated with each condition. Free play elicited significantly more cooperation, compliance and affiliation with peers than did small group time. In addition there was significant growth during a 16-week period in the free play condition for the following measures: autonomous achievement, gross motor activity, and fantasy activity. These same measures decreased during small group time. The author

suggests that the small-group setting may actually encourage affiliation among children at the same time that the format severely restricts child-child interactions, thus setting up a conflict that results in reduced cooperation and compliance.

Looking at the qualities of different day camp activity settings Gump and others suggest more detailed explanations of differences in children's behavior in different settings. Boy campers exhibited significantly more hostile acts in the dining hall than in cookouts and more aggression in cookouts than in swim (Gump, 1964). In a comparison of boy campers' social interactions (sharing, helping, asserting, demanding, and attacking) Gump and Sutton-Smith (1955) found significantly more interactions occurring during swim than in crafts. Gump, Schoggen and Redl (1957, p. 43) assert that

> Certain features of the activity-setting which support or provoke the behaviors and experiences that occur within it are clear. When props and performances are so organized that the valued actions are delayed or in short supply, an activity setting is likely to produce competitiveness whether it is in cookouts or boating. And a setting which requires performances directed at individual tasks is likely to produce lowered interaction whether it is crafts or library reading time.

Barker (1968) looked at differences between undermanned and large optimally manned school settings. In the smaller and incompletely staffed settings students engaged in more and more varied program actions and maintenance actions, fewer vetoing actions and more deviation countering actions. In brief, students participated more in smaller situations where they were needed to perform functions that otherwise would be carried out by staff in the larger better staffed settings.

Thus, it seems that behavior settings need to be analyzed for dysfunctional factors in terms of resulting children's behaviors. Rather than concentrating on getting a child to adapt to various educational subsettings, the preceding studies suggest a search for clues in the structure of the setting. Children may be deviating from an expected pattern of behavior because the setting does not really support the expectations that teachers or adults hold for it.

The effects of materials provided to children in early childhood settings have been studied extensively. It seems appropriate to summarize the main findings at this point rather than to extract principles for the selection and presentation of materials. That materials do influence children's behavior seems clear. Making decisions concerning which behaviors should be enhanced is however a question of educational philosophy and values. The studies covered in this section should shed some light on the behavioral consequences of the presentation of materials in early child settings.

-Choice of materials provided to children is important for holding children's attention, facilitating social interaction, and eliciting cognitive play modes.

-Raw materials (clay, sand, blocks) seem popular with preschoolers, sand and clay elicit solitary and parallel play as well as a functional cognitive level of play. Blocks can facilitate parallel-constructive or cooperative-dramatic play about equally.

-Doll corner or house play elicits the most cooperative and dramatic play.

-Puzzles are characterized by solitary or parallel constructive play.

-Tricycles, wagons, and swings appear to encourage cooperative behavior.

-The variety of materials may encourage purposeful activity and a sufficient number of play spaces per child are necessary to enhance the flow of children from one activity to another during free choice periods.

-Complex and super complex play units can foster cooperative play as well as sustain the play activity of groups of children.

-An abundance of materials facilitates positive behavior in children who are required to follow a rigid schedule of activities.

-Changing the kind of materials can result in changes in social interaction, unusual use of equipment, amount of object manipulation, and level of cognitive play.

-The presence of college and art materials may tend to inhibit dramatic and symbolic play.

-Language emphasis programs tend to raise language comprehension not performance scores.

-The Montessori program and materials appear to encourage solitary and parallel constructive play and to inhibit cooperative functional and dramatic play when compared to a traditional nursery setting.

-Alterations in storage areas, work spaces, size of areas and the inclusion of private space can result in changes in children's behavior in an educational setting.

-Classrooms can vary a great deal in terms of how much active vs. passive child behavior occurs.

-Not only do children differ in their involvement in curriculum activities but activity in some areas is a better predictor of cognitive gain than activity in other areas.

-Accessibility and display of materials may influence the degree of adult supervision and the amount of waiting and disruptive behavior of children.

-Children's preferences for materials vary with age.

Conclusion

This review has attempted to provide an overview of research relating the physical environment of the early childhood educational setting to the dependent variable of children's behavior.[1] This criterion was selected, rather than gains in intelligence or achievement because of a belief in the importance of the child's interaction with the world as the major means of child growth and development. The paper intends to support the position that at least some of the variability in children's behavior in the preschool is linked to the environment. Adopting such a point of view may encourage teachers and administrators to look for sources of desired and undesirable child behavior in an area they can affect, namely the educational setting. Although children come to school with various agendas, the environment they encounter does help shape their interaction with it.

Of special importance in an understanding of the influence of physical space on behavior is the need to analyze space in terms of whether it provides for a full-range of children's behavior. Can a tired unhappy child retreat to some private cozy area and regroup his/her forces or does the space provide only continued stimulation and frustration? Can shy children find small enclosed areas where they can flourish with one or two other children or are such children found on the perimeter of activities watching or playing by themselves?

Perhaps the skill of arranging the early childhood environment to support the maximum involvement of children with materials and

---

[1]For an extensive review of literature pertaining to the effects of school environments in general, please see, Weinstein, Carol S., Department of Education Douglass College. "The Physical Environment of the School: A Review of the Research." Unpublished manuscript, December 1978.

with each other is a skill that can and should be taught. In reviewing the studies summarized here, it becomes clear that systematic observation of children at play in the educational setting is crucial to an analysis of the environment. Examining where the most social interaction, including aggression, takes place can be done at the same time as recording what level of cognitive activity occurs during each scheduled activity period. How much of the time do children wait during transitions, for adults to pass out materials, or for their turn in a small block area? Teachers and administrators might learn to look for such restrictions on child behavior that are imposed by the arrangement of the space and materials.

Although certain activity settings generally elicit characteristic behaviors among children, there can be no one set of prescriptions for the optimal arrangement of space in early childhood settings. The particular group of children enters into an analysis of characteristic patterns of child-environment interactions. Some behaviors may be engendered by stresses in the children's home lives but the provisions made for the children at the center can direct and absorb their frustrations and confusion. At this point it is important to stress the role of adults as an ecological factor in the early childhood environment.[2] Although the arrangement of the physical space and materials can promote behavioral expectations teacher behavior and program format constitute major variables in the early educational setting.

---

[2]The author is currently working on a review of the literature that relates the behavior of adults in early childhood settings to the behavior of children. The paper, entitled "The Ecology of Adult and Child Behavior in the Preschool Setting: A Review of Research" will be available in the fall 1979.

In designing the physical space of the preschool, teachers need to consider the interrelationships among activity settings. If more cooperative constructive and dramatic play is desired can the room(s) absorb the increased activity and noise that will likely result in expanding or adding appropriate materials to the block and housekeeping corners? Are there sufficient workspaces nearby to absorb children, if materials are taken out of closets and displayed on low shelves?

Planning to enhance child-environment interactions involves a study of the ecology of the preschool. Reducing a characteristic behavior in one area may lead to its appearance in another less appropriate area. There is an interdependence of behavior throughout the classroom. The final criterion may be expressed as follows: Do the behavior settings provide for and support developmentally appropriate activity of the children enrolled? Perhaps the goal of studying and working with the physical environment was best stated by Pervin (1968, p. 56):

> A "match" or "best fit" . . . of individual to environment is viewed as expressing itself in high performance, satisfaction, and little stress in the system whereas a "lack of fit" is viewed as resulting in decreased performance, dissatisfaction, and stress in the system. (Pervin, 1968, p. 56)

References

Barker, R. G. Ecological Psychology: Concepts and Methods for Studying the Environment of Human Behavior. Stanford, CA: Stanford University Press, 1968.

Berk, L. E. Effects of variation in the nursery school setting on environmental constraints and children's models of adaptation. Child Development, 1971, 42, 839-369.

Bloom, Benjamin. Stability and Change in Human Characteristics. New York: John Wiley & Sons, 1964.

Body, M. K. Patterns of aggression in Nursery School. Child Development, 1955, 26, 3-11.

Bott, H. Observations of play activities in the nursery school. Genetic Psych. Monographs, 1928, 4, 44-88.

Bridges, K. M. B. Occupational interests in three year old children. Pedagogical Seminary, 1927, 34, 415-423.

Bridges, K. M. B. Occupational interests of four year old children. Pedagogical Seminary, 1929, 36, 551-570.

Brophy, J. E., Good, T. L., & Nedler, S. E. Teaching in the Preschool. New York: Harper & Row, 1975.

Campbell, F. Preschool behavior study in Architectural Psychology Newsletter, 3 (1), August 1979, 59.

Canter, D., & Kenny, C. The Spatial Environment in Carter D. Environmental Interaction. London: Surrey Univ. Press, 1975.

Cockrell, D. L. A study of the play of children of preschool age by an unobserved observer. Genetic Psychology Monographs, 1935, 17,

Cohen, S., & Lezak, A. Noise and inattentativeness to social cues. Environment and Behavior, December 1977, 9 (4), 559-573.

Day, D. E., & Sheehan, R. Elements of a better Preschool. Young Children, 1974.

Deutsch, M. Early social environment: Its influence on school adaptation. In Hechinger, F. (Ed.), Preschool Education Today. Garden City: Doubleday & Co., 1966.

Dodge, D. T. Room Arrangement as a Teaching Strategy. Washington, DC: Dodge, 1978.

Doke, L. A., & Risley, T. R. The organization of day care environments: Required vs. optional activities. Journal of Applied Behavioral Analysis, 1972, 5, 405-420.

Dreyer, A. S., & Rigler, D. Cognitive Performance in Montessori and nursery school children. Journal of Educational Research, 1969, 62, 411-416.

Eastman, C. M., & Harper, J. A study of proxemic behavior: Toward a predictive model. In Environment and Behavior, 1971, 33, 418-437.

Emmerich, W. Evaluating alternative models of development: An illustrative study of preschool personal-social behaviors. Child Development, 1977, 48, 1401-1410.

Farwell, L. Reactions of kindergarten first and second grade children to constructive play materials. Genetic Psychology Monographs, Vol. VIII, No. 5 & 6.

Fitt, S. The individual and his environment. School Review, August 1974, 617-620.

Gramza, A. F. Children's preferences for enterable play boxes. In Perceptual Motor Skills, 1970, 31, 177-178.

Gump, P. V. Intra-setting analysis: The third grade classroom as a special case. In Williams, E., & Rausch, H. (Eds.), Naturalistic Viewpoints in Psychological Research. New York: Holt, 1969.

Gump, P. V. Environmental guidance of the classroom behavioral system. In Biddle, B. J., & Ellena, W. J. (Eds.), Contemporary Research on Teacher Effectiveness, New York: Holt, Rhinehart, & Winston, 1964.

Gump, P. V., Schoggen, P, & Redle, F. The Camp Milieu and its immediate effects. Journal of Social Issues, 1957, 13, 40-46.

Gump, P. V., & Sutton-Smith, B. Activity-setting and social interaction: A field study. The American Journal of Orthopsychiatry, October 1955, xxv.

Hall, E. T. The Hidden Dimension. New York: Doubleday & Co., 1966.

Harms, T., & Clifford, R. M. Day care environment rating scale. Frank Porter Graham Child Development Center, University of North Carolina at Chapel Hill, 1978.

Harms, T., & Cross, L. Environmental Provisions for Day Care. Frank Porter Graham Child Development Center, University of North Carolina at Chapel Hill, 1977.

Herring, A., & Koch, H. L. A study of some factors influencing the interest span of preschool children. Journal of Genetic Psychology, 1930, 38, 249-279.

Hulson, E. L. An analysis of the free play of ten four-year-old children through consecutive observations. Journal of Juvenile Research, 1930, 14, 188-208.

Hunt, J. McV. Intelligence and Experience. New York: The Ronald Press Co., 1961.

Hutt, C., & Vaizey, M. J. Differential Effects of Group Density on Social Behavior. Nature, 1966, 209.

Irwin, D. M., & Bushnell, M. M. Replant your learning garden. Day Care and Early Education, February 1976, 3, 33, 46.

Ittleson, W. H., Rivlin, L. G., & Proshansky, H. M. The use of Behavioral Maps in environmental psychology. In Proshansky, H. M. et al. (Eds.), Environmental Psychology. New York: Holt, Rhinehart, & Winston, 1970.

Ittleson, W. H. An Introduction to Environmental Psychology. Proshansky, H. M., Rivlin, L. G., & Winkel, H. (Eds.) New York: Holt, Rhinehart & Winston, 1974.

Johnson, M. W. The effect on behavior of variation in the amount of play equipment. Child Development, 1935, 6, 56-68.

Kagan, J., Kearsley, R., & Zelazo, P. Infancy and Its Place in Human Development. Cambridge, MA: Harvard University Press, 1978.

Karlson, A., & Stodolsky, S. Predicting School Outcomes from Observations of Child Behavior in Classrooms. Paper presented at AERA annual meeting, February 1973, New Orleans.

Kawin, E. The function of toys in relation to child development. Childhood Education, December 1934, 122-124.

Kohl, H. On finding private spaces. Grade Teacher, January 1970, 87, 10.

Krantz, P., & Risley, T. The organization of group care environments: Behavioral ecology in the classroom. Lawrence, Kansas: University of Kansas. ERIC Document Reproduction No. ED078 915.

Kritchevsky, S., & Prescott, E. Planning environments for young children: Physical space. National Association for the Education of Young Children, Washington, DC, 1969.

Lewin, K. Environmental forces in child behavior and development. In Murchison, C. (Ed.), A Handbook of Child Psychology. Worcester, MA: Clark University Press, 1931, 94-127.

Lewin, K. Field Theory in the Social Sciences, Harper, 1951.

Loo, C. M. The effects of spatial density of the social behavior of children. Journal of Applied Social Psychology, 1972, 2, 372-381.

McDowell, M. S. Frequency of choice of play materials by preschool children. Child Development, 1937, 8.

Mack, D. Privacy: A child's need to be alone in the Classroom. Teacher, February 1976, 93, 52-53.

Mangurian, R. A celebration of space. Day Care and Early Education, December 1975, 3, 14-16.

Markey, F. V. Imaginative behavior of preschool children. Monogr. Soc. Res. Child Development, 1938, 18.

Montes, F., & Bisley, T. R. Evaluating traditional day care practices: An empirical approach. In Childcare Quarterly, 1974, 4, 208-215.

Moyer, K. E., & Gilmer, B. Attention spans of children per experimentally designed toys. Journal of Genetic Psychology, 1955, 87, 187-201.

Murphy, L. B. Sumpathetic behavior in young children. Journal of Experimental Education, 1936, 5, 79-90.

Murphy, L. B. Social Behavior and Child Personality. New York: Columbia University Press, 1937.

Osmond, H. Function as the basis of psychiatric ward design. Mental Hospitals (Architectural Supplement), April 1957, 23-29.

Parten, M. B. Social participation among preschool children. Journal Abn. Soc. Psychol., 1932, 27, 243-269.

Parten, M. B. Social play among preschool children. Journal Abn. Soc. Psychol., 1933, 28, 136-147.

Peck, J., & Goldman, R. The behaviors of kindergarten children under selected conditions of the Social and Physical Environment. Paper presented at the annual meeting of AERA at Toronto, March 1978.

Perry, G. Cross-cultural Study on the Effect of Space and Teacher Controlling Behavior. ERIC Document Reproduction No. ED131 351.

Pervin, L. A. Performance and satisfaction as a function of individual environment fit. Psychological Bulletin, 1968, 69, 56-68.

Pollowy, A. M. The child in the physical environment: A design problem. In G. Coates (Ed.), Alternative Learning Environments. Pennsylvania: Dowden, Hutchinson & Ross, 1974.

Preiser, W. F. E. Work in progress: The behavior of nursery school children under different spatial densities. In Man Environment Systems, 1972, 2, 247-250.

Prescott, E., Jones, E., & Kritchevsky, S. Day Care as a Child-Rearing Environment, Vol. II. Washington, DC: National Assoc. for Educ. of Young Children, 1972.

Price, J. M. The effects of crowding on the Social Behavior of Children. Unpublished doctoral dissertation, Columbia University, 1971.

Proshansky, H. M., Ittelson, W. H., & Rivlin, L. G. The influence of the physical environment on behavior: Some basic assumptions. In Proshansky, H. M., Ittelson, W. H., & Rivlin, L. G. (Eds.), Environmental Psychology: Man and His Physical Setting. New York: Holt, Rinehart & Winston, 1970.

Quilitch, H. R., & Risley, T. The effects of play materials on social play. Journal of Applied Behavioral Analysis, 1973, 6, 575-578.

Rosenthan, B. A. An Ecological Study of Free Play in The Nursery School. Doctoral dissertation, Wayne State University, 1973. (Dissertation Abstracts International, 1974, 37, (7-A), 4004-4005.)

Rubin, K. I. Play behaviors of young children. Young Children. 1977, 16-24.

Rubin, K. W., & Seibel, G. G. The Effects of Ecological Setting on the Cognitive and Social Play Behaviors of Preschoolers. Paper presented at the annual meeting of AERA, San Francisco, 1979.

Santrock, J. W. Affect and facilitative self-control: Influence of ecological setting cognition and social agent. Journal of Educational Psychology, 1976, 68, 529-535.

Shapiro, S. Preschool ecology: A study of three environmental variables. Reading Improvement, 1975, 12, 236-241.

Sheehan, R., & Day, D. Is open space just empty space? Day Care and Early Education, December 1975, 3, 10-13, 47.

Shure, M. B. The psychological ecology of a nursery school. Child Development, 1963, 34, 979-992.

Smith, P. K. Aspects of the playgroup environment. In Canter, D., & Lee, T. (Eds.), Psychology and the Built Environment. England: Architectural Press, 1974.

Smith, P. K., & Connolly, K. J. Social and aggressive behavior in preschool children as a function of crowding. In Social Science Information, 1976, 16, 601-620.

Smith, P. K., & Connolly, K. J. Patterns of play and social interaction in preschool children. In Jones, N. B. (Ed.), Ethological Studies of Child Behavior. London: Cambridge University Press, 1972.

Smith, P. K., & Connolly, K. J. Toys, space and children. British Psychological Society Bulletin, 1973, 26, 167.

Smith, P. K., & Green, M. "Aggressive behavior in English nurseries and play groups: Sex differences and response of adults," Child development, 1975, 46, 211-214.

Sommer, R. Studies in personal space. Sociometry, 1959, 22, 247-260.

Sommer, R. Personal Space: The Behavioral Basis of Design. Englewood Cliffs, NJ: Prentice-Hall, 1969.

Srivastava, R. K., & Good, L. R. Patterns of group interaction in three architectually different psychiatric treatment environments. Research Report, Environmental Research Foundation, Topeka, Kansas, March 1968.

Tizzard, B., Philips, J., & Plewis, I. Play Measures and their relation to age, sex and I.W. Journal of Child Psychological Psychiatry, 1976, 17, 251-264.

Updegraff, R., & Herbst, E. K. An experimental study of the social behavior stimulated in young children by certain play materials. J. Genet. Psychol., 1933, 42, 372-391.

Van Alstyne, D. Play Behavior and Choice of Play Materials of Preschool Children. Chicago: University of Chicago Press, 1932.

Weinstein, C. S. Modifying student behavior in an open classroom through changes in physical design. Am. Ed. Res. Journal, 1977, 14, 249-262.

Weinstein, C. S. The effect of a change in the physical design of an open classroom on student behavior. Unpublished doctoral thesis, Harvard University, 1975.

Weinstein, C., & Weinstein, N. The effect of noise in an open-space school on reading comprehension. Paper presented at the annual meeting of the AERA in Toronto, Canada, March 1978.

Zifferblatt, S. M. Architecture and human behavior: Toward increased understanding of a functional relationship. Educational Technology, 1972, 12, 54-57.